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ANALYSIS OF THE EFFICIENCY OF KARET JATIMLEREK DAM ON AGRICULTURAL IRRIGATION IN PLANDAAN DISTRICT, JOMBANG REGENCY

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ABSTRACT
This study aims to determine the effectiveness of water distribution from the Jatimlerek Rubber Dam in irrigating agricultural land in Jatimlerek, Purisemanding, Karangmojo, and Plandaan Villages, Plandaan District, Jombang Regency. The method used is quantitative. The results obtained are the efficiency of distribution in the Jatimlerek secondary channel of 86.13%. Water loss along the Jatimlerek secondary channel is 0.38% of the efficiency in the secondary channel under normal conditions of 90%, so it can be concluded that Jatimlerek secondary irrigation is less effective. Water loss occurs due to the poor condition of the existing irrigation network lining. The conclusion based on the calculation of water loss and irrigation efficiency along the Jatimlerek secondary channel from BJM 2 - BJM 7 is that water loss is 0.38% and the efficiency of Jatimlerek secondary channel irrigation is 86.13%. Then the condition of the Jatimlerek secondary irrigation structure from BJM 2 - BJM 7 of the six BJMs observed, there were two BJMs that experienced damage to the secondary channels, namely BJM 5 located in Plandaan Village and BJM 7 in Purismanding Village which resulted in a decrease in the flow function.

Keywords: *Jatimlerek rubber dam, agricultural irrigation.*

INTRODUCTION
The irrigation development carried out by the Indonesian Government is an effort to utilize water resources in an appropriate, effective and effective manner to improve the welfare of the Indonesian people. A dam is a construction that is built to hold back the flow of water to become a reservoir, lake or recreation area. Dams are often used to channel water to a hydroelectric power plant (Saputra, 2019). Most dams have sections called sluice gates to remove unwanted water gradually or continuously (Alex, 2023).

The Jatimlerek Motion Dam is one of the various types of dams that exist. This dam is a stream of the Brantas River which is located in Jatimlerek Village, Plandaan District, Jombang Regency. This dam is used to raise the water level of the middle part of the Brantas River during the dry season, to supply irrigation water to rice fields with a standard area of 4,549 Ha (Adi et al., 2020).

The importance of supplying irrigation water to rice fields in Jatimlerek Village, Purisemanding Village, Karang Mojo Village, and Plandaan Village, where the main commodity is rice plants, where water is a very important input for the lowland rice production system which consumes more water. Water availability not only affects plant productivity, planting area and planting intensity, it also has the potential for expanding new areas, and even determines the quality of rice production (Aziz, 2012).

The availability of irrigation water for lowland rice cultivation is increasingly limited due to: (1) Increasing water use for the industrial and household sectors, (2) The duration of rainfall is getting shorter due to climate change, (3) Local water reserves are also decreasing, and (4) A lot of water is contaminated (Kumala & Albab, 2022). With the increasing demand for water from various sectors and the depletion of groundwater supplies, is the water supply from the Jatimlerek Rubber Dam still effective for agriculture in the villages of Jatimlerek, Purisemanding, Karang Mojo and Plandaan?

The aim of this research is to determine the effectiveness of water distribution from the Jatimlerek Rubber Dam in irrigating agricultural land in the villages of Jatimlerek, Purisemanding, Karangmojo, and

Plandaan, Plandaan District, Jombang Regency.

METHOD

Materials used for research include: Books and Journals about Dams, Irrigation and Effectiveness. The tools used in this research are: Paper, ballpoint pen, cellphone, laptop, tape measure, rope, used bottles, wood, camera.

The research location is the Jatimlerek rubber dam in Jatimlerek Village, Plandaan District, Jombang Regency. From the Jatimlerek Rubber Dam, it continues to the primary channel, secondary channel and tertiary channel including the villages of Jatimlerek, Purismading, Karangmojo, Plandaan.

This research method is descriptive quantitative, to determine irrigation effectiveness and irrigation efficiency (Fakhrah et al., 2022):

1. The level of efficiency of the irrigation network in the secondary irrigation network is obtained using the irrigation efficiency analysis equation as follows:

$$Ec = \frac{\text{Base Discharge-Top Discharge x 100\%}}{\text{Base Discharge}}$$

Information:
Ec: Effectiveness
Base Discharge: The amount of water entering
End Discharge: The amount of water that comes out.

2. Factors that influence water loss in secondary irrigation networks (Bunganaen, 2011).

Data collection

The data required in this research consists of primary data, namely field survey data on the irrigation network from the Jatimlerek Rubber Dam in irrigating agricultural land in Jatimlerek, Purisemanding, Karang Mojo, and Plandaan Villages, Plandaan District, Jombang Regency. Secondary data was obtained through literature review, interviews from related agencies, and conducting interviews with farmers in all data collection villages. The data taken are: discharge data, situation map of irrigation areas, irrigation network scheme and planting pattern data.

Field Observation

Observations include: irrigation networks related to the location and area of irrigation areas, determining measurement location points and taking measurements on irrigation channels, and calculating the efficiency of irrigation channels.

RESULT AND DISCUSSION

Results

Irrigation Network Efficiency Levels in Secondary Irrigation Networks

The efficiency level of irrigation networks, especially in secondary irrigation networks, is obtained by calculating water losses that occur in secondary channels. In calculating water loss, the first thing to do is measure the channel discharge in the field, so that you can know the amount of water coming in and the amount of water coming out. The results of channel discharge measurements in the field are presented in Table 1.

Table 1 Calculation of Debit per BJM

No	Bangunan **Jatimlerek (BJM)**	Water Height	Wide	Long	Time	Volume	Debit
1	BJM 2	54cm	352cm	382cm	4.35dt	7.26 cm^3	1.67m^3
2	BJM 3	63cm	401cm	250cm	4.09dt	6.32 cm^3	1.54m^3
3	BJM 4	70cm	346cm	278cm	4.93dt	6.73 cm^3	1.37m^3
4	BJM 5	98cm	148cm	449cm	5.50dt	6.51 cm^3	1.18m^3
5	BJM 6	74cm	249cm	410cm	6.95dt	7.55 cm^3	1.09m^3
6	BJM 7	31cm	303cm	156cm	1.70dt	1.46 cm^3	0.86m^3

After the discharge calculation is complete and the discharge is found, we then move on to calculating the efficiency of secondary irrigation channels which can be seen in Table 2.

Table 2 Calculation of the Efficiency of the Jatimlerek Irrigation Secondary Channel

Irrigation	Base Discharge (m^3/s)	Edge Discharge (m^3/s)	Water Flow Dcreses (m^3/s)	Efficiency
BJM 2 – BJM 3	$1.67m^3$	$1.54m^3$	0.12	92.51%
BJM 5 – BJM 6	$1.37m^3$	$1.18m^3$	0.18	86.68%
BJM 8 – BJM 9	$1.09m^3$	$0.86m^3$	0.23	79.21%
Average			0.38	86,13%

Water losses in the irrigation network can be seen in Table 3.

Table 3 Percentage of Water Loss in Irrigation Network

No	Description	Lost
1	Primary Channel	7,5- 12,5 %
2	Secondary Channel	7,5- 12,5 %
3	Tertiary Plot, between the tertiary tapping building and the rice fields	15- 22,5 %

Discussion

Based on the results of table 1, the location of BJM 2 is in Jatimlerek Village, BJM 3 is in Karangmojo Village, BJM 4 and BJM 5 are located in Plandaan Village, then BJM 6 and BJM 7 are located in Purismanding Village. Based on the results of table 1, the calculation of discharge per BJM Factors that affect water loss in secondary irrigation networks are evaporation, percolation and loss during provision or distribution and waste. Water loss during water provision in secondary channels due to evaporation is generally relatively small, therefore it can be ignored (Sembiring, 2016).

Based on table 2, the efficiency of distribution in the Jatimlerek secondary channel is 86.13%. Water loss along the Jatimlerek secondary channel is 0.38% of the efficiency in the secondary channel under normal conditions of 90%, so it can be concluded that Jatimlerek secondary irrigation is less effective.

Irrigation water losses that occur during delivery (distribution) are mainly caused by seepage in the wet cross-section of the channel, evaporation and operational losses that depend on the irrigation water management system. Describing the first (seepage) and second (evaporation) water losses, the efficiency of delivery (distribution) is often referred to as water conveyance efficiency. Describing the third (operational) water loss, the Management Performance Ratio (MPR) criterion is used which is defined as the comparison between the actual discharge and the planned discharge at various tapping gates during the irrigation operational period (Arnanda et al., 2020). The water losses that occur are usually due to the good/bad condition of the existing irrigation network lining. If the network is technical, it is necessary to conduct a channel investigation regarding the damage that occurs.

Table 4 Building Class Nomenclature Data, Ploso Regional Irrigation UPTD

No	Nomenclature	Baku Rice Fields (Ha)	Kilo Meter (KM)	Information	
				Nomenclature	Pielscal
1	B. IJ. 1		0	Good	Good
2	B. JM. 1 ka	36	0.18	Good	Good
3	B. JM. 2 ka	37	0,37	Good	Good
4	B. JM. 2 ki	16		Good	Good
5	B. JM. 3 ka	38	1,29	Good	Good
6	B. JM. 4 ka	37	1,73	Good	Good
7	B. JM. 4 ki	19		Good	Defective
8	B. JM. 5 ka	52	2,66	Good	Good
9	B. JM. 5 ki	31		Good	Defective
10	B. JM. 6 ka	20	3,24	Good	Good
11	B. JM. 6 ki	18		Good	Defective
12	B. JM. 7 ka	35	3,73	Good	Defective
13	B. JM. 8 ka	25	4,35	Good	Good
14	B. JM. 8 ki	15		Good	Good
15	B. JM. 9 ka	12	4,87	Good	Defective

16	B. JM. 10 ka	19	5,15	Defective	Defective
17	B. JM. 11 ka	45	5,34	Defective	Defective
18	B. JM. 12 ka	67	6,38	Nothing	Good
19	B. JM. 13 ka	2	7,79	Nothing	Nothing
20	B. JM. 13 ki	52		Nothing	Nothing

Description = B.IJ. = Jatimlerek Main Building
B.JM. = Jatimlerek Building.

In the Jatimlerek secondary irrigation network itself, the factors that cause water loss are: evaporation, seepage and because there are several channels that are already damaged. The condition of the channel also affects water loss where the longer the channel, the greater the water loss, as well as the width of the channel. Around the secondary channel, plants were also found, and even entered the water surface in the channel, these damages and plants were found in the middle to the end of the channel, starting from BJM 4 to BJM 11, can be seen in Table 4.

The success of the construction of irrigation networks (physical performance) is also influenced by non-physical factors such as socio-economic conditions, institutional arrangements, the level of knowledge and skills of O (operation) and P (maintenance) officers as well as farmers, agricultural extension workers, and so on. The main problems that cause low irrigation efficiency can be grouped into technical, agricultural, socio-economic and institutional (Bos and J.Nugteren, 1974) in the study (Nurliani et al., 2019).

1. Engineering, among others:
a. Too much water lost due to seepage and percolation from the irrigation system.
b. Lack of control and measuring instruments.
c. Lack of communication for effective operation and maintenance.
d. Lack of drainage network resulting in freezing (water logging) and salinization of agricultural land.

2. Agriculture, among others:
a. Inefficient cropping pattern.
b. Imperfect land management.
c. Insufficient training for farmers.

3. Socio-Economic and Institutional, among others:
a. Insufficient agricultural input facilities, credit and marketing.
b. Coordination between agencies that handle both at the network and farming business levels.
c. The importance of active work from P3A (Farmers Association of Water Users).

Irrigation scheduling is the process of determining the time and amount of water to be applied. Proper scheduling is essential for efficient use of water, energy and other inputs of production facilities, such as fertilizers. Scheduling allows irrigation activities to be coordinated with other agricultural activities including soil cultivation and fertilization. The advantages of proper irrigation scheduling include: increasing the quantity and quality of crop yields, conserving water and energy, and lowering production costs (James, 1988) in Agus et al. (2002).

CONCLUSIONS

Based on a field survey, the condition of the Jatimlerek secondary irrigation structures from BJM 2 - BJM 7 of the six BJMs observed, there were two BJMs that experienced damage to the secondary channels, namely BJM 5 located in Plandaan Village and BJM 7 in Purismanding Village, resulting in a decrease in the function of irrigation flow.

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